

CLAIMS

What is claimed is:

1. A workpiece transport apparatus comprising:
 2. at least one pair of transport stages disposed so as to face one another in at least one vertical direction and employing fluidic expulsion and/or simultaneous expulsion and suction to lift in floating fashion and transport one or more workpieces;
 3. at least one plurality of elevator pins capable of being raised and lowered, disposed on at least one member of the at least one pair of transport stages, and retaining at least one periphery of at least one of the workpiece or workpieces; and
 4. one or more rotating mechanisms for rotating the at least one pair of transport stages so as to permit same to be inverted vertically;
 5. wherein the at least one workpiece is transferred from at least one upper member of the at least one pair of transport stages to at least one lower member thereof in accompaniment to lowering of the respective elevator pins at the at least one upper member of the at least one pair of transport stages when the at least one upper member of the at least one pair of transport stages is inverted vertically by at least one of the rotating mechanism or mechanisms.
2. A workpiece transport apparatus comprising:
 2. at least one plurality of transport stages disposed opposite one another in at least one direction in which one or more workpieces is or are transported and employing fluidic expulsion and/or simultaneous expulsion and suction to lift in floating fashion and transport at least one of the workpiece or workpieces;
 3. at least one plurality of elevator pins capable of being raised and lowered, disposed on at least a portion of the respective transport stages, and retaining at least one periphery of at least one of the workpiece or workpieces;
 4. one or more first rotating mechanisms for rotating at least one of the transport stage or stages which is or are upstream in at least one of the workpiece transport direction or directions to at least one tilt angle less than 180° in at least one direction tending to cause same to be inverted vertically; and
 5. one or more second rotating mechanisms for rotating at least one of the transport stage

14 or stages which is or are downstream in at least one of the workpiece transport direction
15 or directions to at least one tilt angle causing same to face, across at least one of the
16 workpiece transport direction or directions, the at least one transport stage which is
17 upstream in the at least one workpiece transport direction and which is rotated by at least
18 one of the first rotating mechanism or mechanisms;

19 wherein at least one of the respective elevator pins which is at at least one location
20 corresponding to the downstream side in the at least one workpiece transport direction of
21 the at least one transport stage that is upstream in the at least one workpiece transport
22 direction, and at least one of the respective elevator pins which is at at least one location
23 corresponding to the upstream side in the at least one workpiece transport direction of the
24 at least one transport stage that is downstream in the at least one workpiece transport
25 direction, are controlled so as to engage in elevator-type action separately from one or
26 more others of the respective elevator pins; and

27 the at least one workpiece is made to glide substantially under the force of its own
28 weight so as to be transferred from the at least one transport stage that is upstream in the
29 at least one workpiece transport direction to the at least one transport stage that is
30 downstream in the at least one workpiece transport direction in accompaniment to
31 lowering of at least one elevator pin at the downstream side in the at least one workpiece
32 transport direction of the at least one transport stage that is upstream in the at least one
33 workpiece transport direction when the at least one transport stage that is upstream in the
34 at least one workpiece transport direction is rotated in the at least one direction tending to
35 cause same to be inverted vertically by the at least one first rotating mechanism and
36 lowering of at least one elevator pin at the upstream side in the at least one workpiece
37 transport direction of the at least one transport stage that is downstream in the at least
38 one workpiece transport direction when the at least one transport stage that is
39 downstream in the at least one workpiece transport direction is rotated by the at least one
40 second rotating mechanism.

- 1 3. A workpiece transport apparatus according to claim 1 or claim 2 wherein:
 - 2 at least a portion of the respective elevator pins is or are at least partially coated with
 - 3 vibration-dampening material and/or cushioning material having rubber, resin, and/or
 - 4 gel-like silicone as primary component.

4. A workpiece transport apparatus comprising:
 - at least one pair of transport stages disposed so as to face one another in at least one vertical direction and employing fluidic expulsion and/or simultaneous expulsion and suction to lift in floating fashion and transport one or more workpieces; and
 - one or more rotating mechanisms for rotating the at least one pair of transport stages so as to permit same to be inverted vertically while at least one of the workpiece or workpieces is held by fluidic suction to at least one member of the at least one pair of transport stages;
 - wherein the at least one workpiece is transferred from at least one upper member of the at least one pair of transport stages to at least one lower member thereof in accompaniment to reduction, termination, and/or reversal of the fluidic suction at the at least one upper member of the at least one pair of transport stages when the at least one upper member of the at least one pair of transport stages is inverted vertically by at least one of the rotating mechanism or mechanisms.
5. A workpiece transport apparatus according to any one of claims 1, 2, and 4 wherein:
 - at least a portion of the respective transport stages is or are supported so as to permit horizontal and vertical movement.
6. A workpiece transport apparatus according to claim 3 wherein:
 - at least a portion of the respective transport stages is or are supported so as to permit horizontal and vertical movement.